

MATERIAL SAFETY DATA SHEET

CHEMICAL NAME: CEMENTED CARBIDE

1. CHEMICAL AND MANUFACTURER INFORMATION

1-1. Chemical Name :

Cemented Carbide, Coated Carbide and Cemented Carbide Tools

1-2. Company Information

Manufacturer : Kyocera Corporation

Address : 6 Takeda Tobadono-Cho, Fushimi-Ku Kyoto 612-8501

Division : Corporate Cutting Tool Group

Phone No. : 075-604-3651

FAX No. : 075-604-3472

Emergency Contact : General Administration Dept. (Sendai Plant) Phone No. : 0996-23-4121

1-3. Recommended use and Restriction on use :

Cutting tools for mainly metal material, wear resistant tool for deformation processing, special cutters and knives, and tools for printed-circuit board.

2. HAZARDS IDENTIFICATION

2-1. Important and hazardous property and influence

- Fire and Explosion Hazard: Cemented carbide is nonflammable in the solid state. However, dusts produced from grinding may trigger a spontaneous ignition or an explosion if allowed to accumulate.
There is no information available regarding the flash point, ignition limit, and explosion limit etc.

- Health Hazard: Dust from grinding can cause irritation of skin and eyes.

- Environmental Impact: There is no information available to be harmful regarding cemented carbide.

2-2. GHS classification

Not applicable

2-3. GHS label element

Not applicable

3. COMPOSITION / INGREDIENTS / IDENTITY INFORMATION

Cemented carbide may be coated with the following materials:

TiN, TiC, Ti(C, N), (Ti, Al)N, Al₂O₃, (Al, Ti, M)N : M represents one or more metal elements selected from the group consisting of Si, Cr, Mo, W and Nb.

■ Single / Mixture : Mixture (Alloyed Metal)

■ Ingredients and Composition of Cemented Carbide

| Ingredient | Chemical Formula | CAS# | Official Number ,Law for PRTR* | Industrial Safety and Health Law(Official Number) | Composition mass% |
|-------------------|------------------|------------|--------------------------------|---|-------------------|
| Tungsten Carbide | WC | 12070-12-1 | N/A | N/A | 55--96 |
| Tantalum Carbide | TaC | 12070-06-3 | N/A | N/A | 0--20 |
| Niobium Carbide | NbC | 12069-94-2 | N/A | N/A | 0--20 |
| Titanium Carbide | TiC | 12070-08-5 | N/A | N/A | 0--20 |
| Zirconium Carbide | ZrC | 12070-14-3 | N/A | Appendix 9-313 | 0--5 |
| Titanium Nitride | TiN | 25583-20-4 | N/A | N/A | 0--5 |
| Vanadium Carbide | VC | 12070-10-9 | Class-I: 321 | N/A | 0--5 |
| Cobalt | Co | 7440-48-4 | Class-I: 132 | Appendix 9-172 | 0--30 |
| Nickel | Ni | 7440-02-0 | Class-I: 308 | Appendix 9-418 | 0--30 |
| Chromium | Cr | 7440-47-3 | Class-I: 87 | Appendix 9-142 | 0--5 |
| Tungsten | W | 7440-33-7 | N/A | Appendix 9-337 | 0--2 |

*Law for PRTR: Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management

For the details regarding the content of the designated chemical material such as cobalt, nickel, and chromium (effective digit: 2), please contact the above address.

4. EMERGENCY AND FIRST AID PROCEDURES

Inhalation:

- When inhaling high concentrations of dust from grinding, or if symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.), remove the worker from exposure. Give oxygen in the case of breathing difficulty.
- In the case of breath-holding, seek medical attention after giving artificial respiration immediately.
- If irritation or rash persists, seek medical attention.

Skin Contact:

- If the dust from grinding contacts on skin, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

Eye Contact:

- If the dust from grinding contacts on the eyes, flush with clean running water immediately.
- If irritation persists, seek medical attention.

Ingestion:

- If a large amount of dust is swallowed, drink copious amounts of water to dilute it and seek medical attention.

5. FIRE AND EXPLOSION HAZARD DATA

Extinguishing Media:

- For dust explosion or fire, use dry sand, dry dolomite, ABC type dry chemical extinguisher (for general, oil, and electrical fire), or water (avoid using water for the dust from grinding of light metals such as Magnesium, Aluminum, etc.)

Unusual Fire and Explosion Hazards:

- The dust from grinding may trigger a spontaneous ignition under the specific conditions when the particle size is extremely fine and mixed with the grinding fluid with low flash point. When the dust under the specific condition for easily-to-ignite is dispersed into the air, it may exceed the explosion limit. In such cases, assure the personal safety firstly and take the necessary extinguishing measures.

Special Firefighting Procedures: Wear dust-protective mask or other respiratory protective devices.

6. SPILL OR LEAK PROCEDURES:

Health Hazard Protection: Wearing the clothing to minimize the exposure of dust and the respirator is recommended to those who will clean up the dust from grinding.

Environmental Conservation: Dispose of the dust as industrial waste in accordance with appropriate government regulations and avoid leaking into water systems.

Removal Method: About the dust leaked from grinding or machining, isolate a place and remove using the cleaner equipped with the filter which can collect particulates in high efficiency etc. When there is no suitable removal method, let a dust become wet with fog-like water or the wet mop for floors, and remove it.

7. PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Handling: Cemented carbide is a stable material and is not considered to be a physical or health hazard. However, there is the possibility of causing skin problems when contacting the dust or grinding fluid containing cobalt or nickel for long hours or repeatedly.

When dealing with the large-sized product or large quantity, it is necessary to handle with care because cemented carbide has high specific gravity.

When grinding or machining this product, minimize the exposure of the dust and sludge possibly containing cobalt or nickel by local exhaust ventilation and other protective devices.
 Wash hands thoroughly after handling, before eating or smoking. Do not eat, drink and smoke at the handling area.
 Periodic medical examination is recommended for individuals regularly exposed to dust or mist.

Storage: Store in a dry form within doors. Avoid the sudden temperature change and the humid conditions.

8. SPECIAL PROTECTION INFORMATION

Airborne dust is kept from exceeding the criterion value of the permissible concentration indicated to the following table by installation of the local exhaust ventilation. When permissible concentration may be exceeded, a dust protective mask, respiratory protective equipment, etc. are used.

Occupational Exposure Limit values

| Ingredient | Chemical Formula | OSHA*PEL* mg/m ³ (Metal dust concentration) | ACGIH*TLV* mg/m ³ (Metal dust concentration) | JSOH*OEL* mg/m ³ (Respirable dust conc.) |
|-------------------|------------------|--|---|---|
| Tungsten Carbide | WC | N/A | 5 (as W) | N/A |
| Tantalum Carbide | TaC | N/A | N/A | N/A |
| Titanium Carbide | TiC | N/A | N/A | N/A |
| Niobium Carbide | NbC | N/A | N/A | N/A |
| Zirconium Carbide | ZrC | N/A | N/A | N/A |
| Titanium Nitride | TiN | N/A | N/A | N/A |
| Vanadium Carbide | VC | N/A | N/A | N/A |
| Cobalt | Co | 0.1 | 0.02 | 0.05 |
| Nickel | Ni | 1 | 1.5 | 1.0 |
| Chromium | Cr | 1 | 0.5 | 0.5 |

* OSHA: Occupational Safety & Health Administration U.S. Department of Labor

* PEL: Permissible Exposure Limit

* ACGIH: American Conference of Governmental Industrial Hygienists Inc.

* TLV: Threshold Limit Value

* JSOH: Japan Society for Occupational Health

* OEL: Occupational Exposure Limit

* N/A: Not Applicable

Protective Equipments:

Respiratory Protection: Dust-protective mask and respirator are recommended.

Hand Protection: Protective gloves are recommended.

Eye Protection: Safety glasses with side shields or goggles are recommended.

Skin & Body Protection: Avoid the direct skin contact with dust.

Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or vacuuming (with appropriate filters) the clothing, rags or other items. Clean work clothing should be worn daily.

Local exhaust ventilation is recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|-----------------------|-----------------|---------------------------------------|-----------|
| Appearance | Dark gray, etc. | Odor | No Odor |
| pH | N/A | Melting Point | N/A |
| Boiling Point | N/A | Flash Point | N/A |
| Vapor Pressure (mmHg) | N/A | Specific Gravity (H ₂ O=1) | 11.0-15.5 |
| Solubility in Water | Insoluble | | |

Appearance may change depending on composition or coating materials.

10. STABILITY AND REACTIVITY

- Reactivity: If a chemical substance like an acid is contacted, it may cause the harmful generation of gas.
- Chemical stability: The product concerned is in a solid state, and there are not explosiveness, inflammability, combustibility, spontaneous combustibility, water-reactivity, and an oxidation nature, and it is chemically stable under the usual environment.
- Possibility of hazardous reactions: None
- Conditions to avoid: Contact with the following incompatible materials.
- Incompatible Materials: Oxidizing substances (Hydrogen peroxide, Nitric acid, Ammonium nitrate, Nitrogen dioxide, etc.)
Others (Hydrazine nitrate, Acetylene, etc.)
- Hazardous decomposition products: None

11. HEALTH HAZARD DATA

- Acute Toxicity
Data of Products: None
- Skin Corrosion / Irritation
Data of Products: None
- Serious Eye Damage / Irritation
Data of Products: None
- Respiratory or Skin Sensitization
Data of Products: None
- Germ Cell Mutagenicity
Data of Products: None
- Carcinogenicity
Data of Products: None
- Reproductive Toxicity
Data of Products: None
- Specific Target Organ / Systemic Toxicity (Single Exposure)
Data of Products: None
- Specific Target Organ / Systemic Toxicity (Repeated Exposure)
Data of Products: None
- Aspiration Hazard
Data of Products: None

12. ECOLOGICAL INFORMATION

- Mobility: There is mobility in the form of floating dust but basically easy to tend to accumulate.
- Persistence: There is no information available regarding cemented carbide.
- Bioaccumulative Potential: There is no information available regarding cemented carbide.
- Environmental impact: There is no information available regarding cemented carbide.

13. WASTE DISPOSAL PRECAUTIONS

- Disposal Method:
- Some of the principal components such as tungsten carbide, cobalt and nickel are the rare metals and it is preferable to recover and recycle them.
 - Dispose of as an industrial waste in accordance with the law regarding an industrial waste, such as "Waste Disposal and Public Cleaning Law" etc. and the related ordinance made by all prefectures, and cities, towns and villages in Japan.
 - In other region, follow the local regulations.

14. TRANSPORT PRECAUTIONS

No transport regulations in Japan. In other region, follow the local regulations.

United Nations Number : Not applicable
United Nations classification : Not applicable
Marine Pollutant : Not applicable

15. APPLICABLE LAW

Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management in Japan. (Law for Pollutant Release and Transfer Register)

Cobalt : "Class 1 designated chemical substances", Cabinet Order No.132
Nickel : "Class 1 designated chemical substances", Cabinet Order No.308
Chromium : "Class 1 designated chemical substances", Cabinet Order No. 87

Industrial Safety and Health Law (Obligation to produce MSDS: Ministry of Health, Labor and Welfare) in Japan.

Cobalt : The substances are defined in the Article 57-2 of the Act, and the cobalt is listed by No.172 in Appended Table 9 in the Article 18-2 of the Enforcement Order as "Dangerous or Harmful Substances to Be Notified their Names, etc."

Nickel : The substances are defined in the Article 57-2 of the Act, and the nickel is listed by No.418 in Appended Table 9 in the Article 18-2 of the Enforcement Order as "Dangerous or Harmful Substances to Be Notified their Names, etc."

Chromium : The substances are defined in the Article 57-2 of the Act, and the chromium is listed by No.142 in Appended Table 9 in the Article 18-2 of the Enforcement Order as "Dangerous or Harmful Substances to Be Notified their Names, etc."

In other region, follow the local regulations.

16. OTHER INFORMATION

Other hazard and toxicity information

When grinding this product, regarding dust or fumes to generate, the following cautions are required.

Dust or fumes from grinding this product can cause irritation of the nose, mouth, throat, eye mucosa, upper respiratory tract and lungs when inhaled.

Symptoms of overexposure include allergic dermatitis, productive cough, wheezing, shortness of breath, and chest tightness, etc.

Ingestion of the dust containing high levels of cobalt may cause damage of the blood, heart, thyroid gland and spleen. (References: 1)

Recent studies indicate that the repeated inhalation or long term contact of cobalt or nickel or chromium metal may affect the skin, respiratory organs, heart, etc.

(References: from 2 to 5)

Although there is no carcinogenic knowledge about cemented carbide, there is the following knowledge about a raw powder, and composition metal component.

■ Cobalt metal with tungsten carbide

IARC Group 2A : probably carcinogenic to humans (Reference 6)

■ Metallic Cobalt

ACGIH Group A3 : carcinogenic in animals, but the relevance to humans is unknown

IARC Group 2B : possibly carcinogenic to humans

JSOH Group 2B : possibly carcinogenic to humans
(the substance whose evidence is not comparatively enough)

■ Metallic Nickel

ACGIH Group A5 : not suspected as a human carcinogen

IARC Group 2B : possibly carcinogenic to humans

JSOH Group 2B : possibly carcinogenic to humans
(the substance whose evidence is not comparatively enough)

■ Metallic Chromium

IARC

Group 3 : not classifiable as to its carcinogenicity to humans

*ACGIH: American Conference of Governmental Industrial Hygienists Inc.

*IARC: International Agency for Research on Cancer

*JSOH: Japan Society for Occupational Health

Although there is no knowledge of environmental impact about a cemented carbide, there is the following knowledge about composition metal component.

- Cobalt and Chromium may be potentially hazardous to the environment. Particular attention is required regarding the effect to the aquatic organism.

Regarding written contents

Although Kyocera has attempted to provide current and accurate information herein, Kyocera makes no representations regarding the accuracy or completeness of the information and assumes no liability for any loss, damage, or injury of any kind which may result from or arise out of the use of or reliance on the information by any person.

Numerical values, such as content, physics/chemical property, are not guaranteed values.

Please refer to the following websites.

Ministry of Economy, Trade and Industry : <http://www.meti.go.jp/>

Ministry of Environment : <http://www.env.go.jp/>

Ministry of Health, Labor and Welfare : <http://www.mhlw.go.jp/>

IARC (International Agency for Research on Cancer) : <http://monographs.iarc.fr/>

ICSC (International Chemical Safety) Cards : <http://www.nihs.go.jp/ICSC/>

National Institute of Technology and Evaluation : <http://www.safe.nite.go.jp/ghs/list.html>

<References>

- 1) Food & Drug Research Laboratories, Study No.8005B (4.11.84).
- 2) T. Shirakawa et al., Chest.95.29 (1989).
- 3) International Chemical Safety Cards (COBALT, CHROMIUM, NICKEL).
- 4) Danger and hazardous property handbook of a chemical substance (Japan Industrial Safety & Health Association).
- 5) A.O.Bech et al., Brit.J.Ind.,19,239 (1962).
- 6) IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol.86 (2006).